OneAPI, SYCL and the Intel compilers

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Intel Certified oneAPI Instructor

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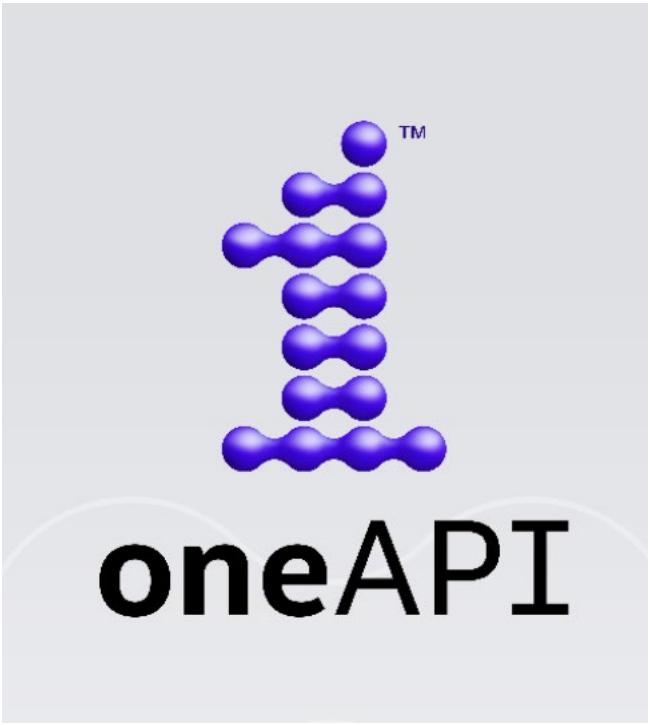
Freedom, Productivity, and Performance
for Accelerated Computing

oneAPI and Intel® Software Development Tools

Software and Advanced Technologies Group (SATG)
Software Products & Ecosystem

March 2024

TWO Standards combine to support Heterogeneity



https://registry.khronos.org/SYCL/specs/sycl-2020/html/sycl-2020.html

https://oneapi-spec.uxlfoundation.org/specifications/oneapi/v1.3-rev-1/

oneAPI

Specification and Open Source

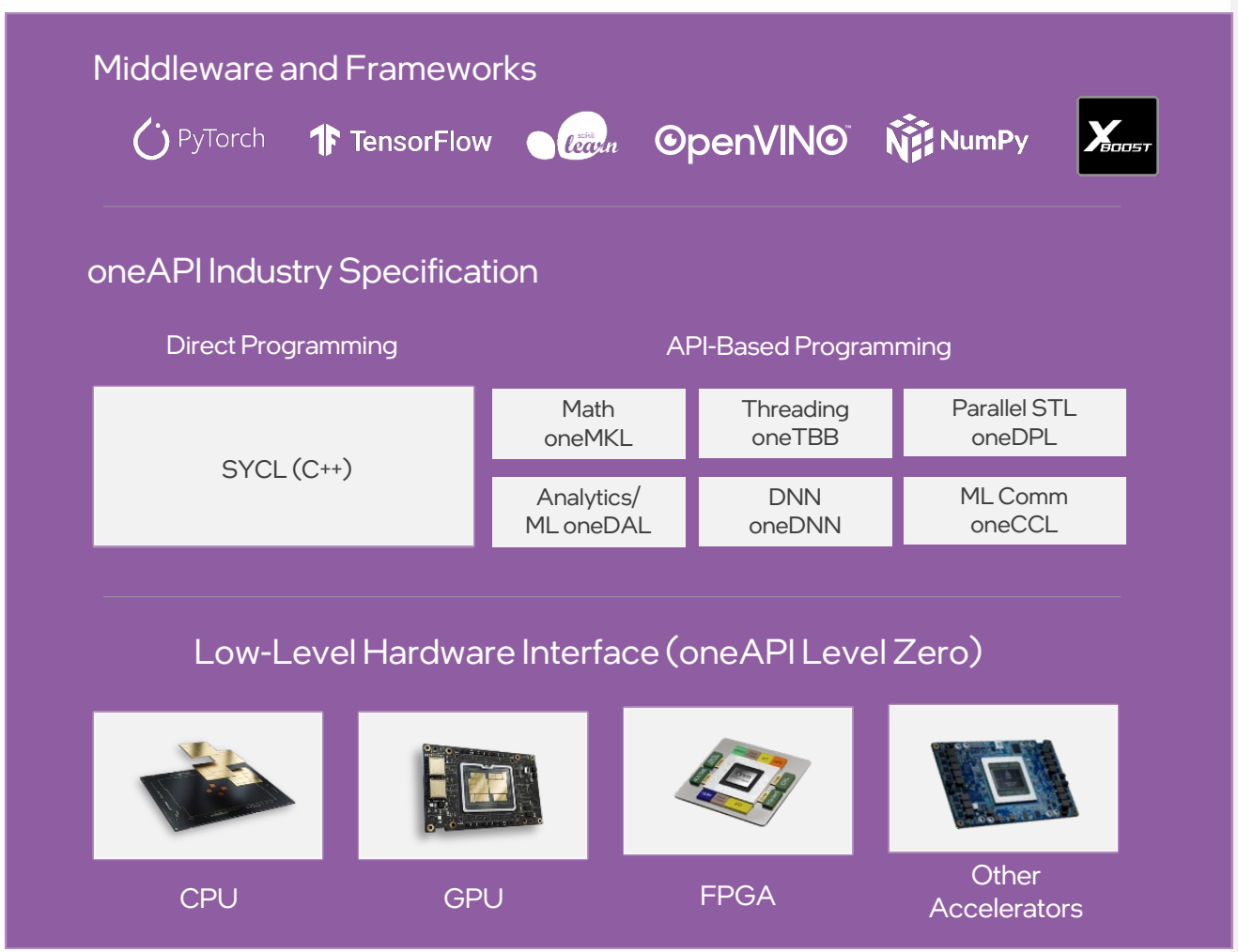
- Standard C++ (SYCL)
- API (Libraries)
- Same code will run different accelerators

oneAPI

Open industry initiative driving a vendor-neutral software ecosystem for multiarchitecture accelerated computing.

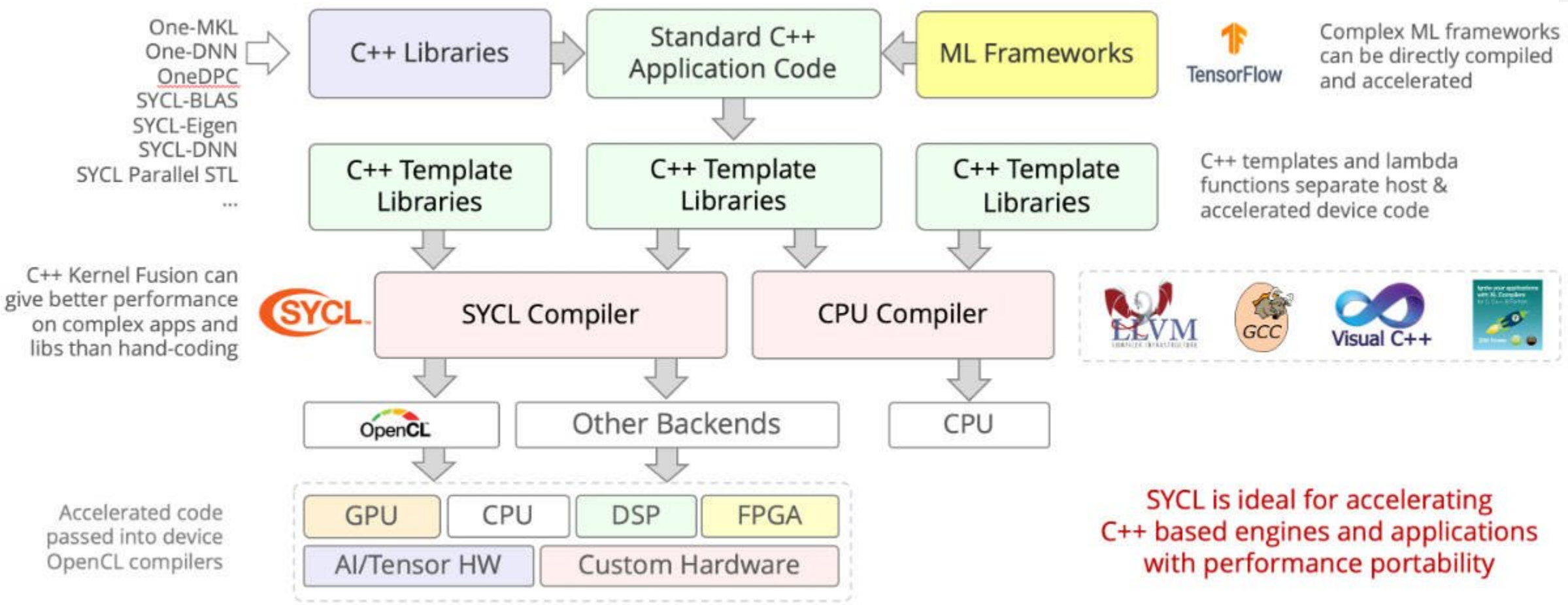
Now governed by the Linux Foundation.

UXL Unified Acceleration Foundation



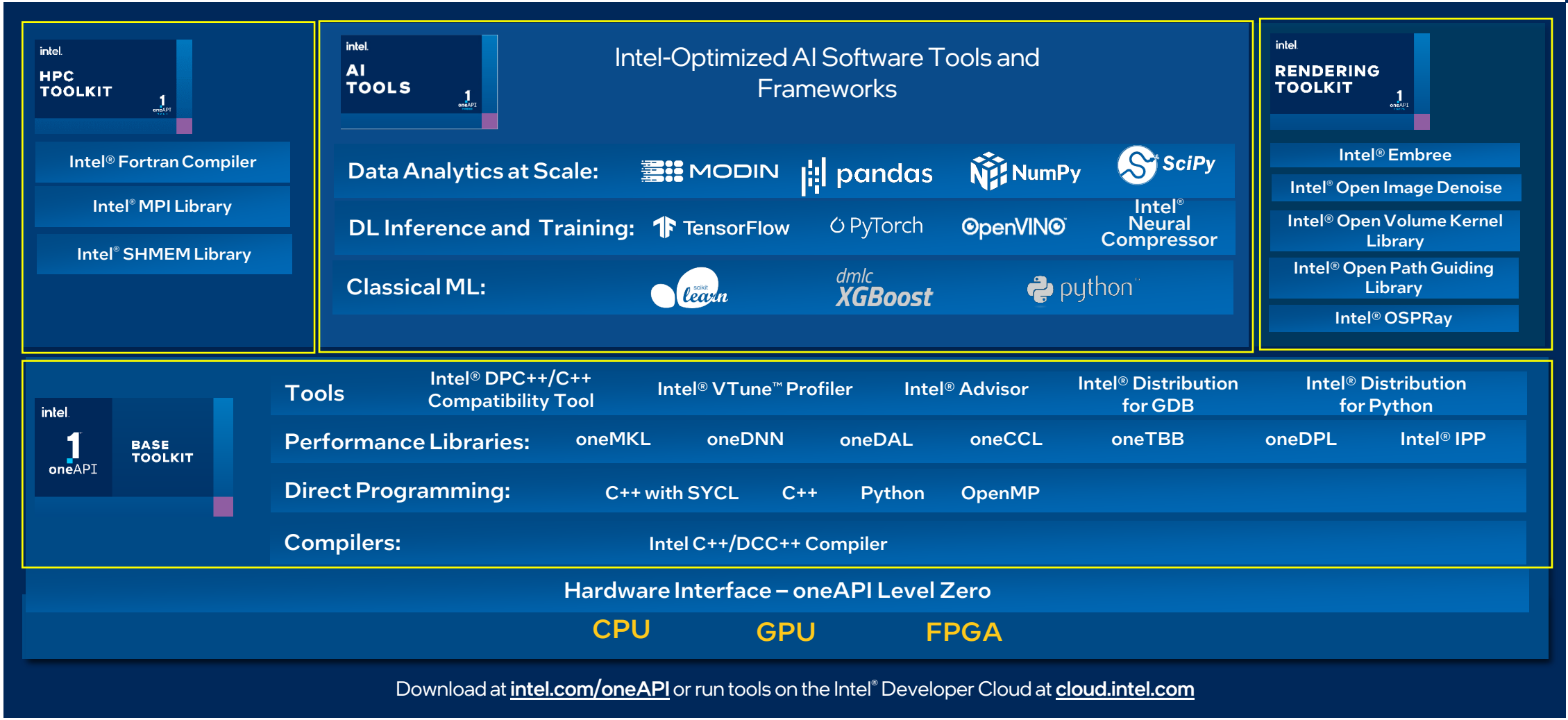
Visit oneapi.io or https://uxlfoundation.org/ for more details

SYCL Compiler and Ecosystem



Intel Software Developer Tools

Flexible, Comprehensive, Open Software Stack – Powered by oneAPI



Download at **intel.com/oneAPI** or run tools on the Intel® Developer Cloud at **cloud.intel.com**

*Other names and brands may be claimed as the property of others. SYCL is a trademark of the Khronos Group Inc.

Available for download or in the cloud

Run the tools locally

visit intel.com/oneAPI

Downloads

Repositories

Containers

Code Samples, Quick-start Guides, Webinars, Training

Run the tools in Intel® Developer Cloud

visit cloud.intel.com

- No hardware acquisition
- No download, install or configuration
- Sample code & documentation
- Ready-to-use deployment & development environments
- Access to cutting edge learning resources.

Professional and Community Support Available

- Download or run tools in the cloud for free
- Every paid version of Intel® oneAPI Base, HPC, and Rendering Toolkit products includes Priority Support
- Intel® Developer Cloud offers Free, Premium (individual), and Enterprise (team) service tiers

*2024.0 tools coming soon to Intel Developer Cloud.

Intel® Developer Cloud

Build Multiarchitecture Applications and Test Workloads on the Latest Intel Hardware and Software

For Developers Provides an **easy path for developers** to access and use Intel-optimized AI software supported by latest Intel CPUs and GPUs.

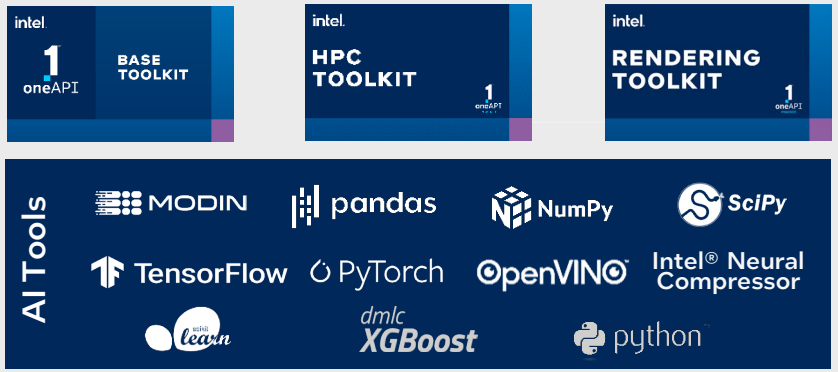
For Enterprises **Accelerate adoption and deployment** of Intel products and technologies and create **new software and services.**

For Partners Provide performance **and cost-optimized Intel AI compute services** to their customers

Free cloud credits available

intel Developer Cloud

Available software tools and optimizations



Available platforms

Visit Intel® Developer Cloud at cloud.intel.com

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2024.0 tools coming soon to Intel Developer Cloud.

What programming language support offloading to gpu?

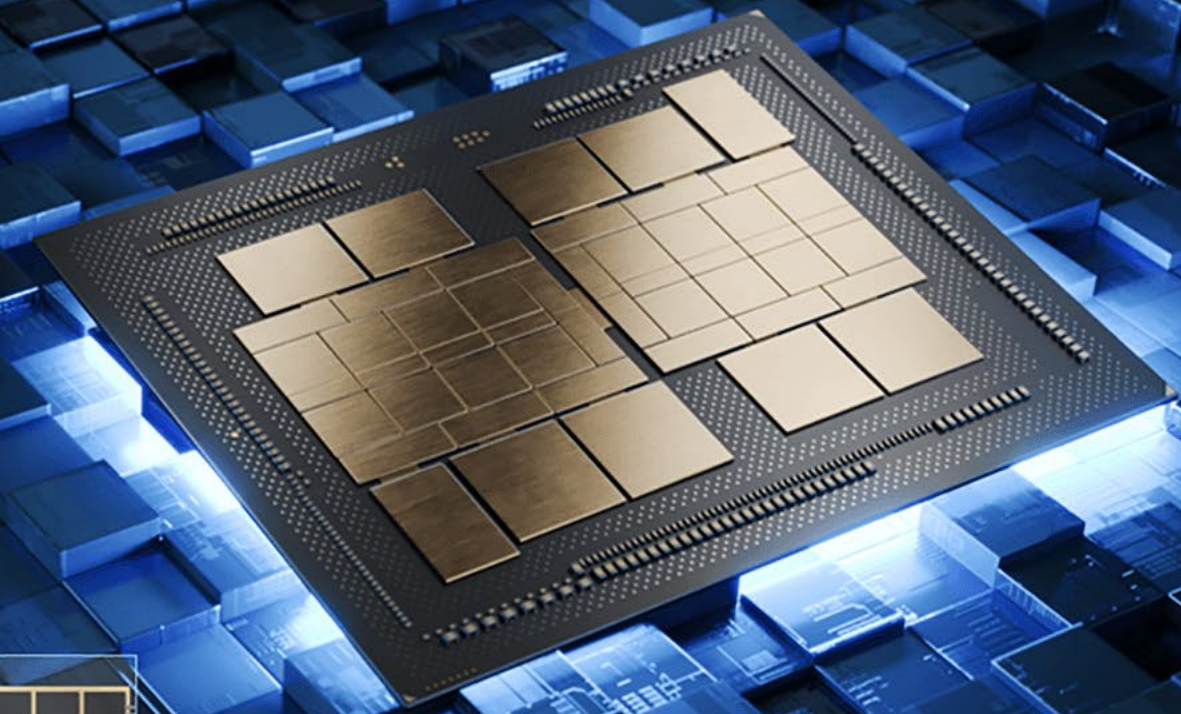
1. **CUDA (Compute Unified Device Architecture)**
2. **OpenCL (Open Computing Language)**
3. **OpenMP (Open Multi-Processing)**
4. **HIP (Heterogeneous-Compute Interface for Portability)**
5. **SYCL (C++ Single-source Heterogeneous Programming for OpenCL)**
6. **Python**
7. **GPU-aware MPI**

Source : Microsoft Copilot (aka Bing Chat)


intel

intel.
DATA CENTER
GPU
MAX SERIES

Intel® Data Center GPU Max Series

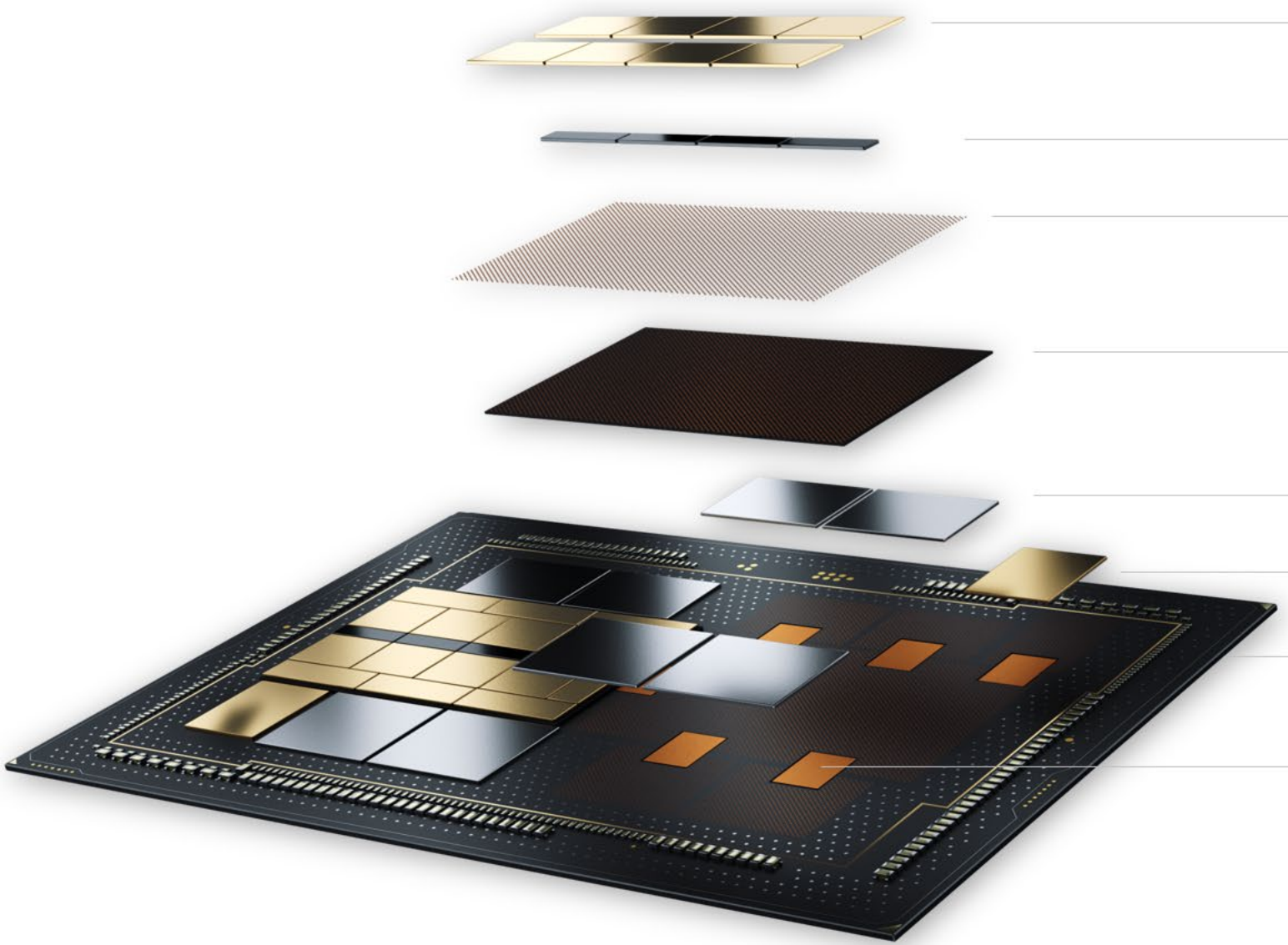


Up to
128
Xe
Cores

52TF
Peak FP64
Throughput

16
Xe Links for GPU-to-GPU communication

High level Xe HPC Stack Component Overview



Xᵉ-core Tile

L2 CacheTile

Foveros

Base Tile

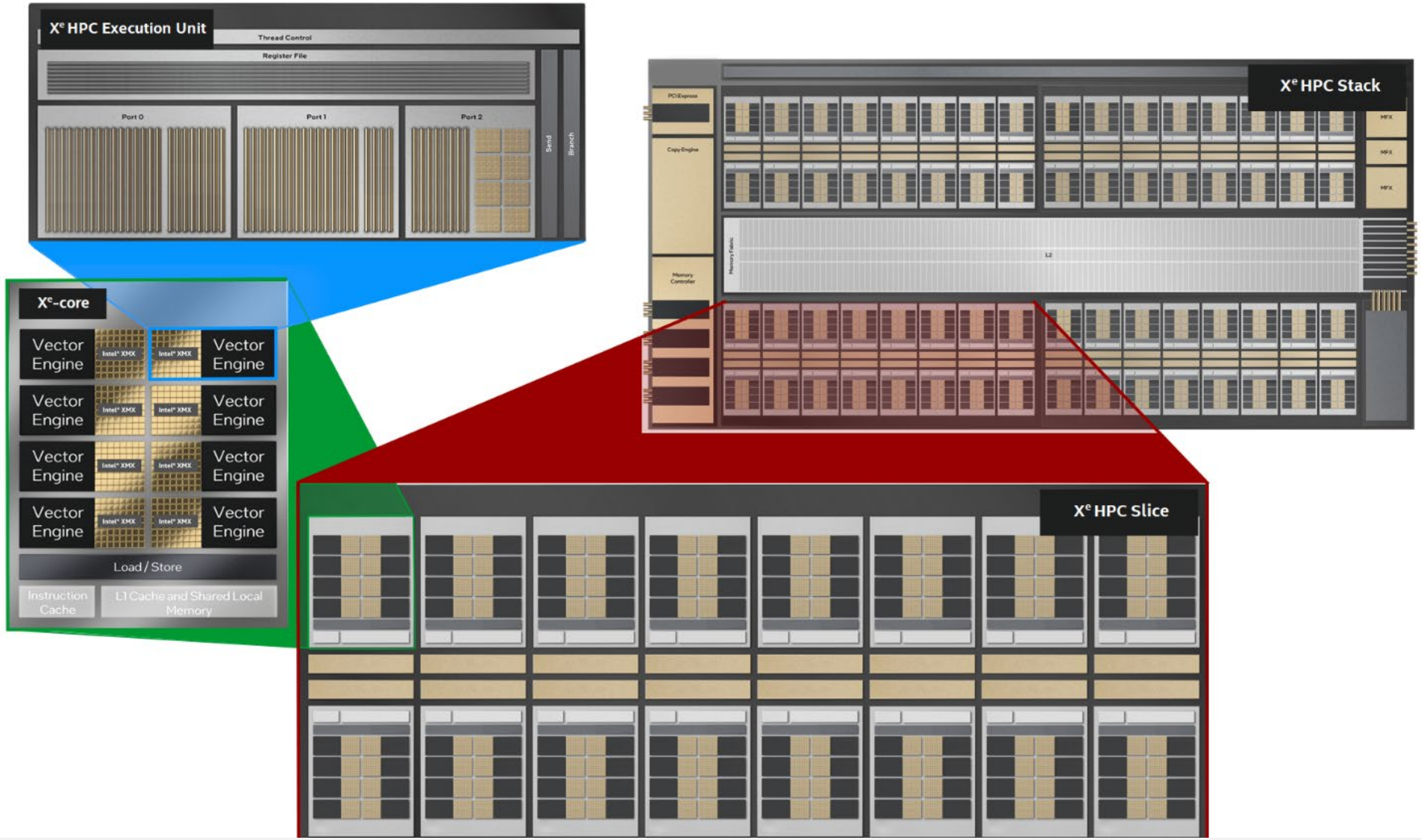
High Bandwidth Memory (HBM) Tile

Xᵉ Link Tile

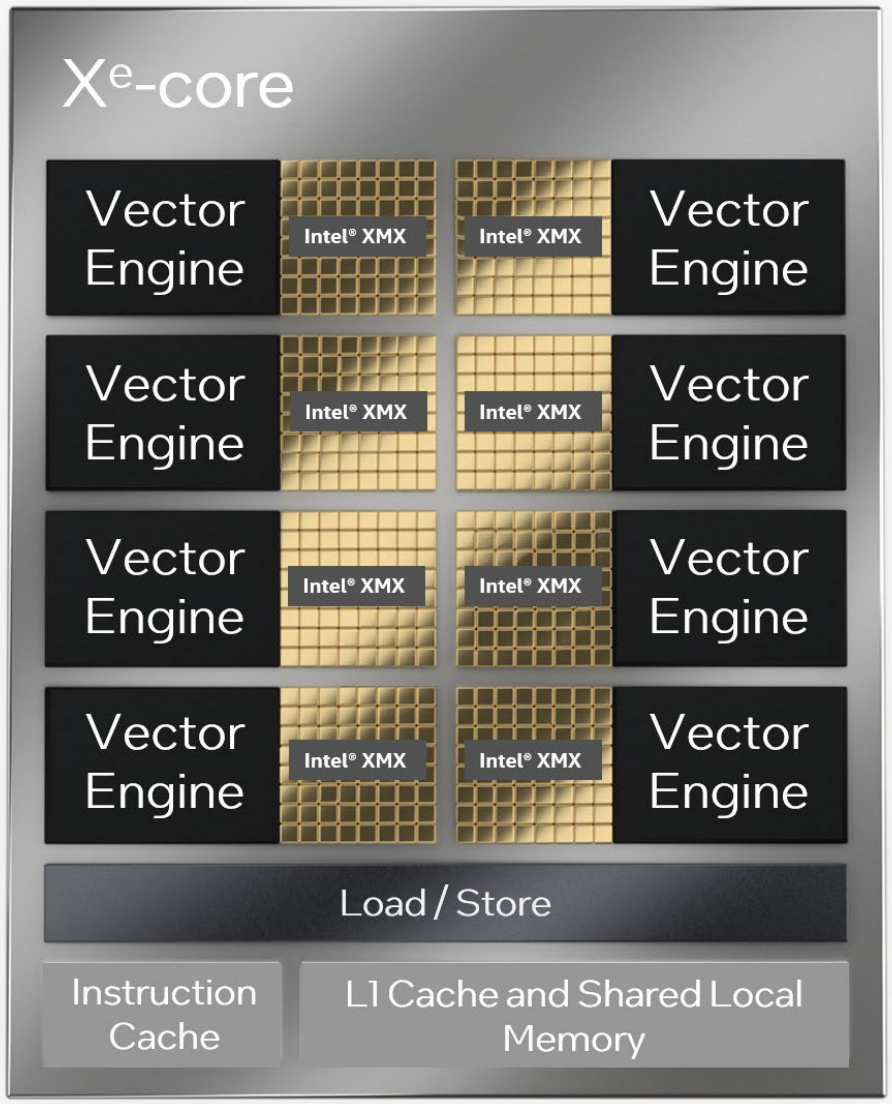
Multi Tile Package

Embedded Multi-Die Interconnect Bridge (EMIB) Tile

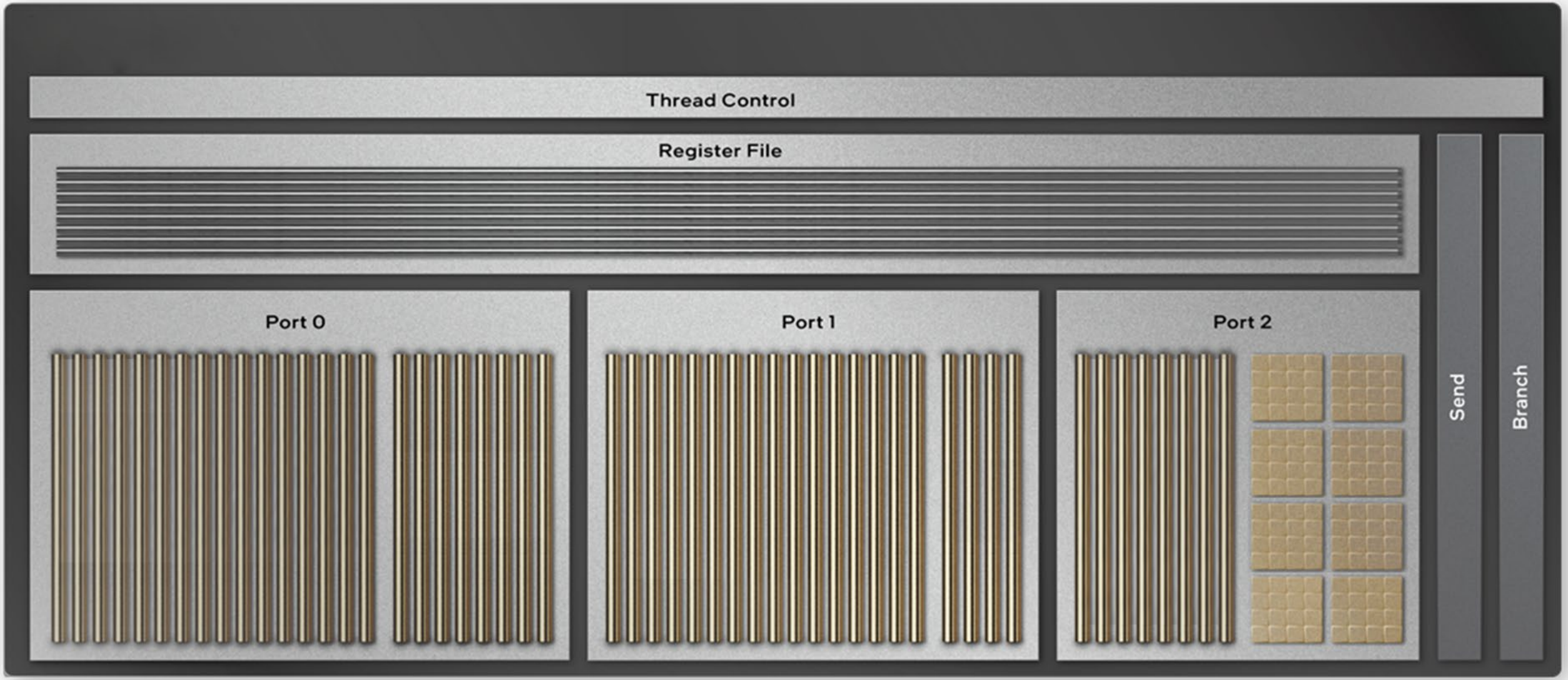
Intel Xe HPC Micro-Architecture

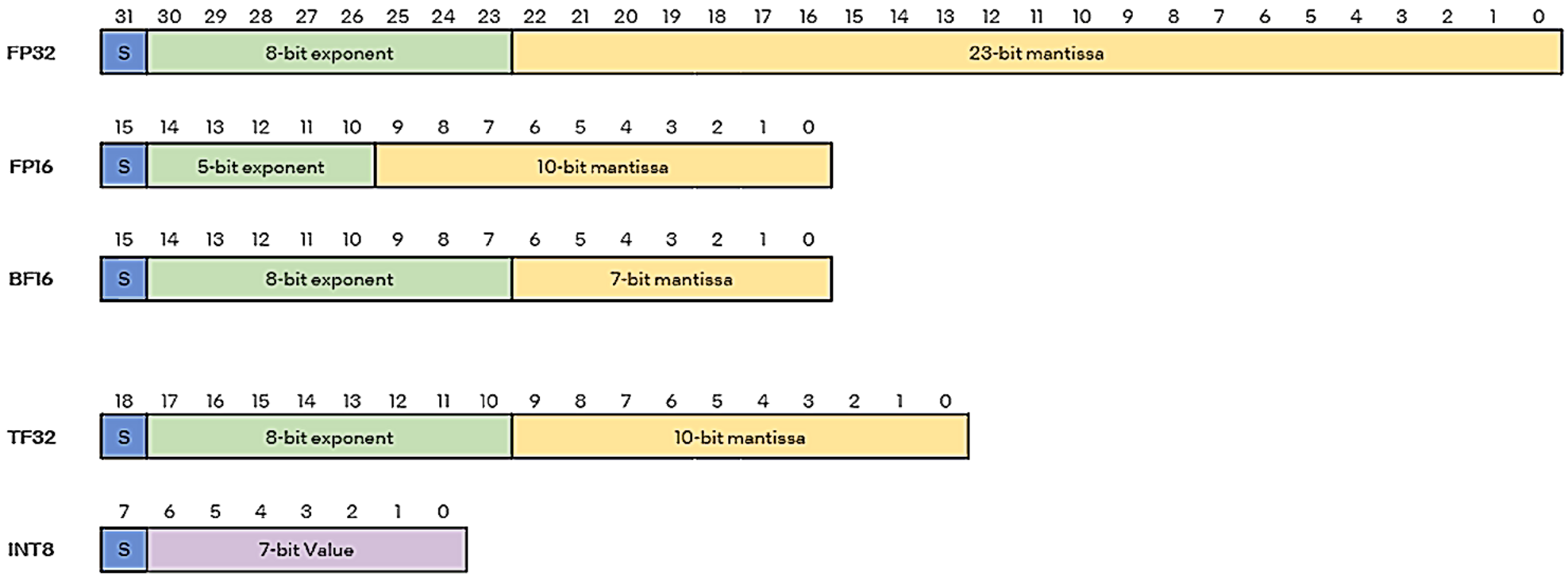


Xe-core Block Diagram



Inside one of the execution units

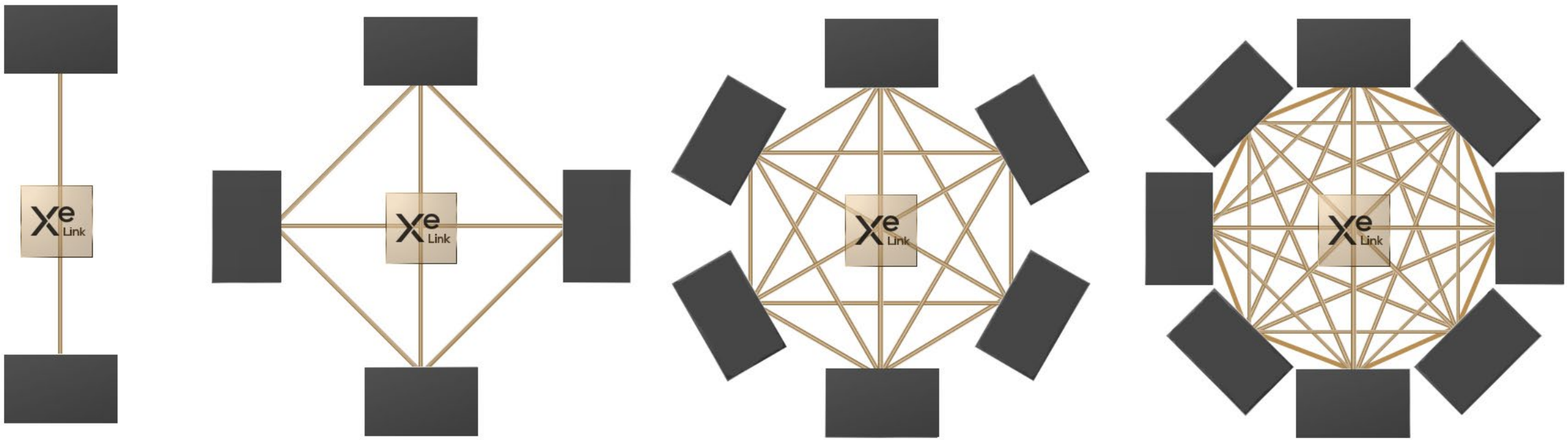


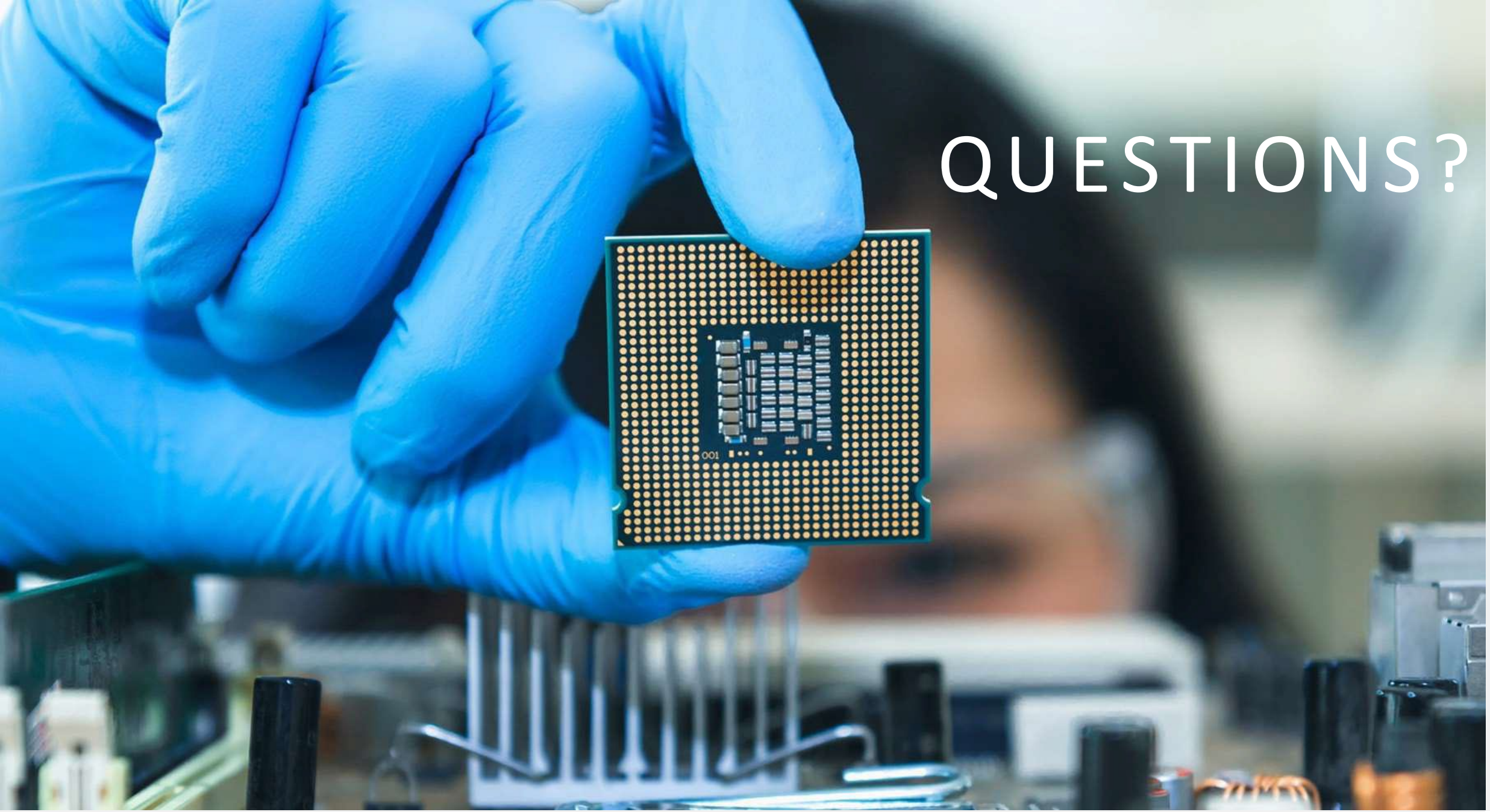

31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
FP32
S
8-bit exponent
23-bit mantissa
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
FP16
S
5-bit exponent
10-bit mantissa
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
BF16
S
8-bit exponent
7-bit mantissa
18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
TF32
S
8-bit exponent
10-bit mantissa
7 6 5 4 3 2 1 0
INT8
S
7-bit Value

Xe HPC Stack


PCI Express
Copy Engine
Memory Controller
Media Engine
Memory Fabric
L2

Intel® Data Center
GPU Max Series




QUESTIONS?

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